

ARMY SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SUBMITTING PROPOSALS ON ARMY TOPICS

Phase I proposals (5 copies) should be addressed to:

Topics #1 through #3

Commander
Armaments Research and Development Center
US Army Armament Munitions and Chemical Command
Building One
ATTN: DRSMC-RAM (D)
SBIR Program
Dover, NJ 07801

Topic #4

Commander
Chemical Research and Development Center
AMC Command
ATTN: DRSMC-CLY-L(A)
Building E5101
SBIR Program
Aberdeen Proving Ground, MD 21010

Topics #5 through #9

Commander
Aviation Research and Development Command
ATTN: DRDAV-PD
Building 105
SBIR Program
4300 Goodfellow Blvd
St. Louis, MO 63120

Topics #10 and #11

Commander
Communications and Electronics Command
Technical and Industrial Liaison Office
ATTN: DRSEL-PDD-PI
Building 2700
SBIR Program
Ft. Monmouth, NJ 07703

Topics #12 through #20

Commander
Electronics Research and Development Command
ATTN: DRDEL-CT-R (J. Johnson)
SBIR Program
2800 Powder Mill Road
Adelphi, MD 20783

Topics #21 through #27

Commander
Mobility Equipment Research and Development Command
ATTN: DRDME-PM
Building 314
SBIR Program
Ft. Belvoir, VA 22060

Topics #28 through #36

Commander
US Army Missile Command
ATTN: DRSMI-ICDA
Building 4488
SBIR Program
Redstone Arsenal, AL 35898

Topics #37 through #41

Commander
US Army Tank-Automotive Command
ATTN: DRSTA-RGI
SBIR Program
Warren, MI 48090

Topics #42 through #45

Director
Army Materials and Mechanics Research Center
ATTN: DRXMR-PP
SBIR Program
Watertown, MA 02172

Topic #46

Commander
Human Engineering Laboratory
ATTN: DRXHE-SS
SBIR Program
Aberdeen Proving Ground, MD 21005

Topics #47 through #58

US Army Natick Research and Development Laboratories
ATTN: DRDNA-EPT
Building Four
SBIR Program
Kansas Street
Natick, MA 01760

Topics #59 through #65

Commander
Construction Engineering Research Laboratory
ATTN: CERL-PP
Plans and Programs Office
P.O. Box 4005
Champaign, IL 61820

Topics #66 through #67

Commander
Engineering Topographic Laboratories
ATTN: ETL-PRO
Plans & Programs Office
Building #2592 Room AG
Ft. Belvoir, VA 22060

Topics #68 through #76

Commander
Waterways Experiment Station
ATTN: WESVB
Building 1000
Box 631
Vicksburg, MS 39180

Topics #77 through #105

Commander
US Army Medical Research and Development Command
ATTN: SGRD-RMA
Ft. Detrick, Frederick, MD 21701

Topics #106 through #110

Commander
US Army Research Institute for the Behavioral and Social Sciences
ATTN: PERI-PO
Room 6E06
5001 Eisenhower Avenue
Alexandria, VA 22333

Topic #111

Commander
BMD Systems Command
ATTN: Small and Disadvantaged Business Utilization Office
P.O. Box 1500
Huntsville, AL 35807

Army Research Topics for FY84 SBIR Solicitation

A84-001 TITLE: Millimeter Wave and Sub millimeter Wave Technology

DESCRIPTION: A need exists for development of improved radar fire control capability involving lightweight compact radar for low-angle track and response to arm threats, and advanced signal processing techniques.

A84-002 TITLE: Automatic Recognition

DESCRIPTION: A need exists for development of a means of recognition of military targets which may be partially or wholly obscured by clouds, smoke, or dust and without known range to target, for improved fire control sensing and signal processing.

A84-003 TITLE: Armament System Software Quality

DESCRIPTION: Field Maintenance Test Sets (FMTS) Acceptance – The software (Test Program Set (TPS)) is the crucial components of FMTS, because it determines diagnostic and fault isolation capabilities. The current practice of validating TPSs through fault insertion requires research in developing a statistical foundation to make accept/reject decisions using sampling techniques. Software Module RAM Measures – The advent of ADA and the Military Computer Family offers a chance to utilize standard, proven software components, or modules, as a means to improve system development in terms of Reliability, Availability, and Maintainability (RAM). To take advantage of this, software modules will not only have to be catalogued in Army-wide libraries, with excellent descriptive documentation, but will also have to be assessed and measured as to their RAM (or analogous) characteristics. Software Test Driver Design – There is need for developing design techniques which are well founded in statistics and mathematics to minimize test cost but maximize logic path coverage. Requirement Analysis Measures – The critical task in developing software is the incorporation of design requirements into computer code. The correct implementation into code of requirements such as message traffic load capacity, navigational error tolerance, etc., is assessed by analyzing the requirements in terms of completeness (adequacy of the requirements achievable and measurable statements which describe the design objectives clearly); traceability (clear relationships between component tolerance and system functional baseline); and consistency (avoidance of contradictory requirements). These terms, or attributes, must be evaluated before coding takes place. There is a need for measuring these attributes in a consistent way on all software development programs to assure that the project is ready for coding. SQAM Knowledge Engineering Database Software Quality Assessment and Measurement is the control loop to the software development process. There is a need for an artificial intelligence, knowledge engineering, and database to offset what will continue to remain a critical shortage of qualified SQAM personnel in the Army.

A84-004 TITLE: Biological and Toxin Detection and Sampling

DESCRIPTION: The US Army has need for innovative technology to collect and detect biological (pathogen) and toxin aerosols (0.1-10 size). Detection limits of 1-100 particles per liter of air are desired. Emphasis should be on technology that could result in small, lightweight, detectors operating on batteries. Proposals should consider novel approaches to aerosol sampling as well as detection.

A84-005 TITLE: Lightweight Sling Length Adaptor for Helicopter External Cargo Sling

DESCRIPTION: A need exists to conceive, design, fabricate and test a method of adjusting the length of the individual legs of nylon or Kevlar rope sling sets. An adjustor will be used with each of four external cargo sling legs which attach to the helicopter hook and terminate with a 2 ½ to 3 inch inside diameter loop. A 2 ½ to 3 inch inside diameter lift eye or other hoisting provision is provided for attachment at the payload. Discrete adjustments in the distance between the rope sling leg loop and the payload lift eye of between 1 and 6 feet are required. Sling length adjusters should be sized for use with 10,000-, 25,000-, and 40,000-pound sling sets and should have ultimate strength capabilities of 20,000, 40,000 and 60,000 pounds per leg, respectively. The adjustment method should

allow the rigger to adjust the length in the dark basically by feel, provide positive locking, and be significantly lighter than comparable-strength metal chains and hooks.

A84-006 TITLE: Helicopter Cockpit Ergonomics

DESCRIPTION: The aircrew of future helicopters such as the LHX will be the critical limitation in mission performance and effectiveness. Advanced technology and avionics can provide more capabilities, systems, and displays than the crewmembers can possibly exploit. Much of the proposed automation will not reduce the workload, but will simply shift it from hands-on flying to supervisory control and decision-making. Workload, performance, and even training must be considered in the initial design phase of future helicopter cockpits. There is a need for concentrated research to develop a predictive methodology which relates the human pilot to the proposed systems in advance of commitment to hardware development.

A84-007 TITLE: Woven Fabric Reinforcements for Composites

DESCRIPTION: Present fabrics used in the manufacture of composite structures do not exploit the inherent multidirectional capabilities of weaves for greater fracture toughness, resistance to interlaminar stresses, and isotropy in individual piles. Innovative approaches to the systematic development of woven fabrics incorporating modern weave technology could produce improved composites structures for specific applications such as minimum gage structure, bolted joints, and thick sections.

A84-008 TITLE: 3D Viscous Code for Flow-Through Turbo machinery Diffusers

DESCRIPTION: Accurate correlations do not exist between design predictions and experimental performance of diffusers of centrifugal compressor stages in gas turbine engines. New approaches are required to predict the performance of high mach number diffusers for maldistribution of flow ahead of the diffusing section. The protection capability should be applicable over a broad flow range to allow the development of high-efficiency compressors.

A84-009 TITLE: Helicopter Rotor Data Transfer System

DESCRIPTION: Current helicopter research and flight test instrumentation requires the use of mechanical slip rings or expensive, unreliable transmitter/receiver systems to transfer information such as loads and pressures measured on the rotor hub and blades to the nonrotating environment of the airframe. An innovative device for inexpensively and reliably transferring data from the rotating to fixed system is required for research and test applications and for future applications to advanced rotor/control concepts.

A84-010 TITLE: Artificial Intelligence Techniques for Tactical Decision Aids

DESCRIPTION: Current and planned C3 systems provide basic information; hopefully in a format that eases decision-making of the planning process itself. By applying AI techniques, the system could be given a war-gaming of a WHAT IF...input. This allows the user to access the consequences of his potential commands before they are actually brought into effect. We call the particular knowledge base that is used to bring about this capability a Tactical Inference Model (TIM), as it is a model of the resources on a battlefield with the ability to infer facts from the model. The question that must be answered is: Can such a TIM with a useful decision-aiding capability be constructed in a useful form for the operation that it is designed to support?

A more advanced type of TIM would be one that adjusts its knowledge model based on feedback from its user; that is, it can consider its user as an expert, if the user so desires. This type of system suggests a response and allows the user to rate the "soundness" of the response. The system then rates the user and his response and "improves" its knowledge base accordingly. This type of system can initially be quite "dumb" and acquire the necessary

knowledge through use. The major barrier for which there are not as yet practical solutions with this type of system is that consistency checks must be done on the fly.

A84-011 TITLE: Conceptual Approaches to Novel Netted Communication Systems

DESCRIPTION: Distributed-Survivable Tactical Communications are required for the developed for dispersed, survivable command and control nodes with application down to the small-unit level. The ultimate objective of this thrust is to provide systems to integrate battlefield information from all assets on the battlefield and provide what is needed to each commander. This can be accomplished through conceptual approaches to novel netted communication systems, exploiting technological breakthroughs in microprocessors to yield orders of magnitude improvement against electronic and physical threats.

A84-012 TITLE: Material Processing and Fabrication Techniques for Passive Millimeter Wave Devices

DESCRIPTION: Develop new and improved ferrite and dielectric materials for millimeter wave applications in order to produce high-performance, low-cost millimeter-wave devices such as phase shifters, switches, and circulators operating in the 26 GHz through 140 GHz frequency range.

A84-013 TITLE: Aerosol Modification Techniques

DESCRIPTION: Identify and establish feasibility of methods to modify the natural and battlefield-induced aerosol components of the atmosphere in order to alter visibility for tactical advantage. Investigate and evaluate available and projected methods for altering the properties of the atmospheric aerosol to enhance or decrease its propagation characteristics. Determine the feasibility of the techniques for use on scales applicable to the battlefield.

A84-014 TITLE: Vertical Profile Measurements of Atmospheric Turbulence

DESCRIPTION: At present the path-weighted vertical profile of atmospheric optical turbulence is being measured with a stellar scintillometer at night. Seven regions from 2.2 to 18.5 km are delineated. The need exists for new techniques that would provide better height resolution and extended ranges, as well as daytime operation.

A84-015 TITLE: Research in ELINT/ESM

DESCRIPTION: Highly accurate, real-time detection, identification, and location of noncommunication threats across the entire battlefield area is a primary concern. Antenna, receiver, and signal processing research is required for application to intelligence, VISTA targeting, and responsive countermeasure activation.

A84-016 TITLE: Research in Support of Electronic Warfare

DESCRIPTION: The major concern in this technology thrust area is jammer power management. Techniques applicable to standoff, high-power jammers and very lightweight penetration jammers are of interests.

A84-017 TITLE: Research in Self-Protection Countermeasures

DESCRIPTION: This thrust is concerned with advanced countermeasures research in detection, location, and identification of radar, heat-seeker, and electro-optical threats and techniques and countering these threats.

A84-018 TITLE: Research in Electronic Counter-Countermeasures (ECCM)

DESCRIPTION: The area of technology addresses concepts for reducing the vulnerability of electronic US Army Communications-Electronics Weapon Systems.

A84-019 TITLE: Research in Artificial Intelligence Applied to Electronic Warfare Systems

DESCRIPTION: Techniques to improvements of EW sensors, jammers, and interactive EW systems

A84-020 TITLE: Signature Data Base Development

DESCRIPTION: Provide application programs that can access System 2000 data base through its procedural language interface. Provide software to generate synthetic imagery by inserting targets into different background images. Augment the information in this database by entering target coordinates, target type, and performance statistics.

A84-021 TITLE: Urban Warfare Explosive Detector

DESCRIPTION: Future military operations in most areas of the world will involve fighting in urban terrain. High-speed, portable devices are required to detect and locate the explosive contents of mines, booby traps, demolition charges, and remotely activated munitions concealed within this terrain. Devices which employ bioelectronic principals are of particular interest since techniques of this nature offer promise of both high specificity and high sensitivity. The term "bioelectronic" is not specifically intended to refer to attempts to synthesize in vivo physiological systems by means of electronic devices, although such approaches are not to be excluded from consideration. A strict definition of bioelectronic is withheld herein to allow bidders to exercise considerable latitude in research protocols.

A84-022 TITLE: Research in Advanced Composites

DESCRIPTION: Feasibility of using ultrasonic excitation to enhance the liquid resin infiltration of glass fiber and graphite fiber in the preparation of organic matrix composites. An analogous study could be undertaken for the infiltration of molten metal into tows of graphic fiber and silicon carbide fiber in the making of metal-matrix composites.

A84-023 TITLE: Thin Thermal Infrared Reflecting Materials

DESCRIPTION: Thin flexible materials (tenths to hundredths of a micron thick) are needed that reflect over 90 percent of incident thermal radiation (2.5-5.5, 7.5-14) and transmit over 90 percent of incident microwave radiation (5-250 GHz).

A84-024 TITLE: Thin Microwave (5-250 GHz) Attenuating Materials

DESCRIPTION: Thin flexible materials (25-100 thick) are needed that absorb over 50 percent of incident microwave radiation and transmit less than 10 percent of incident microwave radiation. Emphasis should be given to the frequencies 5-20 GHz.

A84-025 TITLE: Clarification of Turbid Natural Water by Centrifugation

DESCRIPTION: Investigate the feasibility of using centrifugation to reduce the size and weight of the clarification equipment (multimedia filter and cartridge filters). Used in Army water purification units.

A84-026 TITLE: Destruction of Toxic Chemical Agents in Natural Water by Use of Enzymes

DESCRIPTION: Investigate the feasibility of using enzymes to destroy various toxic chemical agents in natural water being treated to produce potable field Army water supplies. Current state-of-the-art treatment requires the absorption of these agents on powered activated carbon or granular carbon columns. The simple addition of enzymes to the water purification unit feedwater could possibly provide improved water purification technology for the treatment of field Army water supply sources contaminated with chemical warfare agents.

A84-027 TITLE: Automated Container Acquisition Systems

DESCRIPTION: Within the Logistic-Over-the-Shore (LOTS) scenario, there is the requirement to transfer containers from non-self-sustained containerhips to landing craft while in open seas. Presently, the ability to transfer at elevated sea states is impossible. Operations in other than calm seas is life threatening. In order to provide an effective interface at elevated sea states, technologies must be explored which address relative motion compensation and remote container acquisition.

A84-028 TITLE: Automatic Acquisition Algorithms and Processors

DESCRIPTION: There is a need for automatic acquisition algorithms which process imaging data from television and infrared seekers. These algorithms should be capable of operating without gunner (operator) assistance in the adverse battlefield environment. The primary targets are tactical vehicles such as tanks, personnel carriers, and air defense guns/missile launchers. The missile system employing these sensors may be launched either from the ground or air platforms. Innovative research is needed to develop algorithms and processors which will operate in real time. Those of specific interest are given below:

- a. Moving Target Algorithms – A good moving target algorithm is needed that is independent of the sensor platforms motion, operates over the whole image, detects slowly moving targets with a low false alarm rate, and operates without external input from the carrier.
- b. Passive Ranging – A simple passive ranging technique is needed which will provide an estimate of range to any point in the scene without relying on inputs relative to the sensor platform orientation.
- c. Prescreening/segmentation – Algorithms are needed for this high-throughput section of the processing which can isolate the potential target areas while maintaining a balance between missed detections and excessive false alarms.
- d. Processor Architecture – Unique architectural designs which can implement selected image processing functions with an increased throughput that will permit real-time operation are needed.

A84-029 TITLE: Long-Range Fiber Optics Guidance Transmission Technology

DESCRIPTION: A need exists to investigate critical optical fiber communication and fiber payout techniques required for long-haul missile applications. Communication involves research into the components needed for long-range, wide band data links. Specific issues to be addressed include single-mode fiber, sources and detectors, and modulation techniques. Payout system concerns are winding loss evaluation, spool design, payout at missile velocity, and storage and fabrication. Results would include demonstrations of a prototype system in the laboratory environment.

A84-030 TITLE: Evaluation of Optical Modulation Techniques for Fiber Optics Imaging Links

DESCRIPTION: A need exists to develop theoretical analysis and experimental evaluation of the modulation/encoding techniques which are applicable to any fiber optics imaging link. The transmission of video data from an imaging sensor in a missile such as the Fiber Optical Guided Missile (FOG-M) requires an encoding/decoding process for imaging data. Since the fiber link also attenuates the video signal, optimum encoding/decoding techniques needed to preserve the signal-to-noise ratio and the signal bandwidth. Practical limitations of the fiber, modulators, and receivers also effect the quality of the image.

A84-031 TITLE: Radio Frequency Simulation Technology

DESCRIPTION: In order for hardware-in-the-loop (HWIL) simulators to be able to effectively test and evaluate current and future state-of-the-art Army missile systems, the capabilities of current simulators must be modified and improved, and proposed simulators must be designed with cost effective, innovative simulation tools and techniques. The current concept for Radio Frequency (RF) environmental modeling requires that utilization of general-purpose computers to implement realtime models of such phenomena as clutter, multipath, and targets. This approach works well for non-high resolution missile systems, but lacks the ability to provide a realistic environment to high resolution systems cost effectively. There is, however, a potentially cost effective solution: Very Large Scale Integration/Very High Speed Integrated Circuits (VLSI/VHSIC). There exists a need to investigate the compatibility of the environmental modeling requirements with VLSI/VHSIC technology and determine its applicability to implementing "algorithmic chips."

A84-032 TITLE: Millimeter Wave Simulation Technology

DESCRIPTION: In order for hardware-in-the-loop (HWIL) simulators to be able to effectively test and evaluate current and future state-of-the-art Army missile systems, the capabilities of current simulators must be modified and improved and proposed simulators must be designed with cost effective, innovative simulation tools and techniques. Currently known HWIL simulation techniques such as the matrix array, ellipsoidal reflector, and passive reflector array have fundamental limitations in displaying the electromagnetic environmental phenomenology to millimeter wave (MMW) missile systems. A wide field of view matrix array is cost prohibitive; the ellipsoidal reflector suffers from chamber reverberations; and the passive reflector array provides only passive track in the end game. The requirement is to investigate cost effective solutions that will provide a wide instantaneous field of view to MMW seekers and sensors continuously from detection through acquisition, track, guidance, and active/passive terminal.

A84-033 TITLE: Multispectral Simulation Technology

DESCRIPTION: In order for hardware-in-the-loop (HWIL) simulators to be able to effectively test and evaluate current and future state-of-the-art Army missile systems, the capabilities of current simulators must be modified and improved, and proposed simulators must be designed with cost effective, innovative simulation tools and techniques. With the advent of multispectral (RF/IR or MMW/IR) seekers and sensors, simulators must be able to provide simultaneous RF and IR or MM and Infrared (IR) energy to the device under test in a single chamber. The current concept (at RF) for providing this capability requires utilization of two materials each with unique properties. The first material must be translucent to RF and reflective to IR and the second must be translucent to both and act as a lens at IR wavelengths. The requirement is to investigate the properties of a variety of materials to determine which have potential of fulfilling these properties.

A84-034 TITLE: Pursuit Engagement Error Methodology

DESCRIPTION: The essential guidance input to establish an intercept is the pursuer's angular tracking of the target. If the tracking is corrupted by quasi-optical imperfections of the electromagnetic window, the radome of the tracking antenna, the pursuit guidance is disturbed. Such disturbances can be described statistically as the stationary spatial function of the bore sight error in dependence of the look angle of the tracking antenna. During the homing

engagement, this spatial function is mapped into the time domain as a noise function whose spectrum is a function of the pursuit geometry as it evolves. At the same time, the evolution of the pursuit engagement depends on the corruptive influence of the noise spectrum. Given a spatial distribution of bore sight errors (obtained via laboratory measurements) and a set of initial conditions of a pursuit engagement, the need exists for analytical methods to trace the influence of the spatial bore sight error functions on the homing performance.

A84-035 TITLE: Optimal Multimode, Real-Time Message Transmission Path Analyses

DESCRIPTION: A typical Command and Control System can have upward of 400 transmit/receiver nodes when operating in a tactical battlefield environment. The selection of an optimal multimode transmission path to achieve the highest probability of the transmission message being received is a major task in achieving effective command and control systems operations in a dynamic battlefield environment. Using expert system problem-solving methodology or knowledge base representation, the need exists to develop an efficient automated strategy for determining optimum multimode, real time message transmission paths in a large array of receiver/transmitter nodes operating in a dynamic tactical battlefield environment. Included in this need is the requirement to keep the problem-solving methods separate from the domain-specific knowledge.

A84-036 TITLE: Missile Flow field Measurement Instrumentation

DESCRIPTION: There exists a need to develop instrumentation to measure the flow field of a missile. Two critical problem areas must be solved before this can be accomplished:

Sub micron Particulate – In the determination of the flow field about a missile, physical devices that are placed in the flow field alter the very flow field that one is attempting to measure. In order to correct this instrumentation deficiency, nonintrusive techniques have become a necessity for missile flow fields. This is particularly necessary in the interaction regions such as the base, in the vicinity of control surfaces, and at expansion and compression regions. The technique that currently shows a tremendous amount of promise is the use of a Laser Doppler Velocimeter (LDV) to make these nonintrusive flow measurements. The limiting factor to the accuracy of the LDV is the ability of the particulate to follow the gaseous flow stream. The ability to follow the flow is dependent directly on the size of the particulate used to seed flow. There exists a need to develop a submicron particulate that can be utilized as a flow field seed. This requires that the particulate be in the range of 0.3 micrometer or smaller. This particulate must not agglomerate in the gas flow stream.

Fluorescent Particulate – There are instances in the determination of the flow field of a missile which require that multiple seeding of a flow field be employed. This is particularly necessary in the base region of a missile where three distinct flow regions exist. In this mixing region there exists a need to develop a seeding technique by which a determination could be made as to the origin of the seed. One way to accomplish this is to utilize a fluorescent particle which will fluoresce in the fringe volume of an LDV. The operating conditions for the measurement tool range up to supersonic velocities as high as mach number 3.5 . This fluorescent particle must be in a size range below approximately 0.3 micrometer and must fluoresce for a period long enough to be within the LDV fringe volume. Additionally, the signal level must be measurable.

A84-037 TITLE: Vehicle Onboard Water Generation

DESCRIPTION: Develop an onboard water generating system for a combat vehicle to eliminate the present water-carrying requirement for the extended battlefield scenario. As an example, this could be accomplished by chemical processing of air, purification of the human liquid elimination, or extraction from the engine combustion process.

A84-038 TITLE: Vehicle Onboard Oxygen Generation

DESCRIPTION: Develop an onboard oxygen-generating system for a combat vehicle to provide a necessary amount of oxygen for the breathing need of humans. In the chemical warfare situation, at present, the breathing air is

supplied to the individual after filtration of the outside air. This process need some type of power and also creates logistical problems for providing filters.

A84-039 TITLE: Vehicle Waste Disposal System

DESCRIPTION: Develop a method of elimination and disposal of human waste for a combat vehicle crewman dressed in chemical protective clothing. In the chemical warfare situation, it is impossible for a combat soldier to eliminate human waste due to restriction of protective clothing. A system is needed to allow elimination of human waste without complete removal of the protective clothing. If in the combat vehicle, then disposal of this waste is also a problem.

A84-040 TITLE: Nondestructive Evaluation of Rubber-to-Metal Bond Strength

DESCRIPTION: The Army uses several parts in tank suspension systems (road-wheels, track pads and shoes, etc.), in which rubber, bonded to metal for vibration isolation, is subject to high loads which causes peeling when bond strength is marginal or low. Current ultrasonic procedures can detect unbonded rubber, but have not yet proven successful for detecting below specification bond strength. Currently, the only method used for establishing bond strength is destructive sampling in which a percentage of the lot is destroyed, while the remaining portion of the lot goes uninspected.

A nondestructive method for determining quantitative values of bond strength is needed. Such a method would permit inspection of all rubber-to-metal bonds and eliminate asset loss due to destructive testing.

A84-041 TITLE: Measure of Actual Tensile Closure Forces in Bolted Joints

DESCRIPTION: Currently, all military vehicles are assembled to specified torque values since torque can readily be measured. Two problems exist with tightening to torque values: one, significant and varying amounts of torque are required to overcome a potentially wide range of bolt frictional forces in the thread and head areas resulting in a loss of torque available to generate bolt tension, and two, tightened bolts cannot be inspected without disturbing the bolted joint.

Ultrasonic measurement of bolt stretch during assembly is not acceptable because of the bolt cost and the attendant cost of record-keeping on bolt lengths.

A rapid, simple method is required for measuring bolt tensile stress through the ends of the bolt.

A84-042 TITLE: Joining Technology

DESCRIPTION: A greater effort is needed in the development of joining technologies for combinations of materials in present and planned Army systems. Such materials would include aluminum armor, ultra-high hardness steel sheet and plate, metal-matrix composites, and bulk ceramic/metal combinations. Developments in joining technologies should address not only feasibility but also the probability for use in an industrial environment at normal production rates.

A84-043 TITLE: Lightweight Materials and Material Systems with Improved Armor Capability

DESCRIPTION: Primary threats to structured armor systems include small-, medium-, and large-caliber high-density bullets as well as chemical energy warheads. These threats have shown a steady growth in lethality such that protection with conventional armor requires prohibitively high weights. New materials concepts are needed incorporating a capability of defeating selective munitions, surviving multiple hits, yet retaining structural capability at the lowest possible weight.

A84-044 TITLE: Hard Coating for Optical Systems

DESCRIPTION: Broadband sensors require hard, erosion-resistant coatings which are transparent from ultraviolet, through the visible, well into the infrared radiation wavelengths. New concepts for such coatings compatible with state-of-the-art optical materials are desired. Such concepts should also address the practicality of operating reliably and reproducibly in a production mode.

A84-045 TITLE: Manufacturing Methods for the Economic Fabrication and Structural Application of Fiber-Reinforced Organic Matrix Composites

DESCRIPTION: Effort would include demonstrating the feasibility of manufacturing techniques for producing components from fiber-reinforced organic matrix materials for those structural applications in which high-strength/weight or high-stiffness/weight ratios are required. Innovative manufacturing techniques dealing with hybrids of reinforcements/polymers (thermoset or thermoplastic)/core materials are sought. Innovations may include variations of injection molding, RIM molding, resin transfer molding, including improvements in adaptive in-process controls as well as use of robotics in part/material handling. Manufacturing techniques for high service temperature polymers such as PEI, PEEK, PPQ are of interest. Manufacturing techniques for some of the new versatile structural foam materials on the market (PU, PMI, syntactic) for molding homogeneous foam cores for a variety of densities (2-8 lbs/ft³), yet maintaining structural integrity of a nomex-type core material are also of interest. Manufacturing techniques for producing ambient-temperature, rapid-cure (2-4 hour) repair kit resins including prepegs with chemical and physical properties approaching those of 3500 degrees F cure high-performance epoxies would also be applicable.

A84-046 TITLE: Robotics

DESCRIPTION: Robotics is the topic of significant activity within the Department of the Army and DARCOM. Results of 2 years of effort in this technical area have led to an emphasis on combat service support/material handling issues as areas of maximum near-term leverage for robotics. The specific areas of technical interest include soldier-machine interface in the robotics context, high payload-to-weight manipulator structures, sensor equipped and effectors, and passive sensing systems for field robotic application.

A84-047 TITLE: New Lightweight, High-Tensile, Durable Small-Tent Fabric

DESCRIPTION: The Army has a need for one-man and two-man tents that are man portable, lighter, and smaller than those currently used. New tent fabrics are needed to meet these requirements as well as to provide protection against the effects of high altitude, cold weather, and light penetration.

A84-048 TITLE: Standardization Program to Develop Standard Grade Rule (Body Growth of Garment) for Similar Clothing Items

DESCRIPTION: Extensive anthropometric data have been generated as a basis for design and sizing of clothing. Lack of standardized rules for grading similar clothing items has hindered the effective use of these data. An automated system is needed to standardize grading procedures.

A84-049 TITLE: Novel Individual Cooling Concepts

DESCRIPTION: The Army has a need for development of novel individual cooling units which are lightweight, man portable, and would provide 1200 BTU/hr of cooling for a minimum of 6 hours, independently of any other cooling source.

A84-050 TITLE: Regulation of Soldier Body Heat in Hot and Cold Environments

DESCRIPTION: Develop data leading to methods for regulating body heat of soldiers in extreme hot and cold environments.

A84-051 TITLE: Thermal Radiation Suppression of Hands, Face, and Feet

DESCRIPTION: To develop a means of providing the same level of thermal camouflage for the hands, face, and feet as is provided by the soldier's uniform.

A84-052 TITLE: Lower Emission Pollutants from Burners Using Diesel Fuel

DESCRIPTION: Burners using diesel fuel liberate about 25% more pollutants than burners using gasoline in terms of N(O)x, CO, and formaldehyde. A means of reducing the amount of pollutants liberated is required.

A84-053 TITLE: Nonpowered Automatic Controls for Use in Diesel Burners

DESCRIPTION: The burners used in military field feeding are self-contained and nonpowered. Automatic control of ignition, fuel and air mix, and flame height is needed, but they have to be nonpower operations. The design should have an allotted fuel tank with remote fuel tank operational capability.

A84-054 TITLE: Collapsible Food Service Bowls

DESCRIPTION: Develop collapsible bowls that are sturdy, impermeable to water and oil, and can be extended to ½ liter capacity (slightly more than one pint). These are needed for serving stews and casseroles in remote sites.

A84-055 TITLE: Development of an Individual Water Cooler/Heater for Combat Field Rations

DESCRIPTION: Develop a water cooler/heater for individual combat field rations capable of being transported by an individual or mounted on a vehicle.

A84-056 TITLE: Carbon Reactivation in CP Garments

DESCRIPTION: Develop a practical means of reactivating carbon powder and fiber in a CP garment which has been subjected to vapor poisoning, without damaging the structural properties of the fabric.

A84-057 TITLE: Portable Device for Determining Sorption of Chemical Protection Garment Materials in the Field

DESCRIPTION: A device is needed for field testing of chemically protective over garments. Miniaturization of standard carbon tetrachloride or agent penetration devices is acceptable. Refer to MIL-C-43858A for procedures.

A84-058 TITLE: Critical Configuration of Active Carbon from Maximum Sorptivity

DESCRIPTION: Design a method for detection of activated carbon (powder or fiber) in or on a substrate and its ability to prevent agent vapor penetration through the substrate. Also determine "filtration efficiency" of various carbon arrangements and attempt to identify critical configuration in terms of weight or packing density.

A84-059 TITLE: Resource Leveling Technique in Construction Network Analysis

DESCRIPTION: The objective of this research is to determine if a simulation program such as "SLAM" can be used in conjunction with a network analysis program, such as PERT, to solve the resource-leveling problems associated with the use of PERT networks. The research should be done in two phases. In Phase I, the basic concept would be demonstrated in a pilot model using simple, non probabilistic networks (CPM networks). In Phase II, the techniques would be extended to complicated networks having probabilistic completion times (PERT networks).

A84-060 TITLE: Construction Technology Forecasting

DESCRIPTION: The objective of this research is to develop a technology forecast of emerging trends in the construction industry. The forecast should identify any and all emerging technologies that have the potential to significantly affect building acquisition, design, and construction. The identified technologies should be ranked by the significance of their impact and by the time at which their impact will be felt. Methods and procedural changes required to exploit the new technologies should be delineated.

A84-061 TITLE: Technologies for Diagnosing Building Energy Inefficiencies

DESCRIPTION: Over the last several years, many individual technologies have been developed to analyze various aspects of building energy efficiencies (i.e., infrared scanners, blower door test, tracer gas test, etc.). These various techniques have been mainly applied to residential buildings. Also, the integration of these techniques into an overall method for the analysis of an entire buildings energy efficiency is missing. This research looks to develop new approaches to building diagnostics (particularly those which can be applied to large buildings) and to the integration of energy diagnostic techniques to give an overall building evaluation program.

A84-062 TITLE: Advanced Technologies for Control of Heating, Ventilating, & Air Conditioning (HVAC) Systems

DESCRIPTION: This research project involves the development of optimal control equipment and strategies for HVAC systems which minimize energy and maintenance costs. Strategies must be adaptive and may involve artificial intelligence/expert system technologies. Furthermore, schemes must be capable of being implemented and maintained by relatively unskilled staff and able to diagnose system faults on equipment performance degradation.

A84-063 TITLE: Protective Coatings for Underwater Applications

DESCRIPTION: The Corps of Engineers has many hydraulic structures which are in constant immersion in either fresh or sea water. Many of the structures include pipes, sheet pile, and other steel members which must be painted for corrosion protection; however, dewatering the structure to apply the paint is costly if not impossible. It is desired that a paint be developed which can be easily applied to these underwater structures to provide long-term corrosion protection.

A84-064 TITLE: Portable Fuel Analysis System for Determining the Composition and Combustion Characteristics of Coal

DESCRIPTION: The proposal system would consist of a set of sampling and analytical procedures for measuring the most common composition and combustion characteristics of coal. Typical composition characteristics would be coal sizing, ash content, and sulfur content. Typical combustion characteristics would be volatile matter and fixed carbon, moisture content, free swell index, ash fusion temperature, and heat content. The procedures should be designed so that they can be adequately handled by a technician at a typical industrial-scale boiler plant. The fuel analysis system should be "portable" in that it does not involve sampling or analytical procedures which require large or complex pieces of equipment that are difficult to relocate.

A84-065 TITLE: Testing Procedures for Asbestos in Military Facilities

DESCRIPTION: The Toxic Substances Control Act (TOSCA) prohibits the use of asbestos in new buildings and requires that old buildings such as schools be inspected for asbestos. There is a need for asbestos identification techniques that can be used in the field by technician type personnel. The identification techniques should be specific enough to satisfy the requirements of TOSCA and be acceptable to the EPA.

A84-066 TITLE: Soft-Copy Stereoviewing Device

DESCRIPTION: Currently there exists no integrated off-the-shelf soft-copy stereoviewing system. Stereoviewing is accomplished for the most part by using anaglyphic or polarization techniques, which are not popular with the typical operator. Optical systems in use are awkward and inefficient. Phase I will consist of an analysis of stereoviewing soft-copy techniques, which concentrates on resolution and operator comfort, and development of a design plan for such a device. Phase II will consist of fabrication and testing of a prototype device. Design goals include a resolution of at least 20-30 line pairs per mm and an ultimate production cost similar to the cost of two 1024x1024 black and white computer display devices.

A84-067 TITLE: Consensus Theory and Expert Systems

DESCRIPTION: New strategies in decision making may be needed to measure confidence associated with results derived from computer production rules in expert system programs. The basic question here is: Are the concepts associated with fuzzy set theory and theories of evidence, such as G. Shafer's, more in keeping with what is meant by the expert's imprecise statements than are the generally used Bayesian concepts? Is it possible to develop a consistent consensus theory using the appropriate theory from probability, fuzzy sets, belief functions, resolution, and relaxation methods? Can such a consensus theory be utilized to expedite decision making in expert systems as well as produce more reliable decisions?

A84-068 TITLE: Concrete Armor Unit Instrumentation

DESCRIPTION: The purpose of this effort would be to develop a design for a low-cost, disposable, self-contained, embeddable instrument and data storage package (IDSP) and an external, portable data retrieval unit (DRU) for measuring and recording strain histories inside concrete breakwater armor units. The IDSP would be programmable prior to embedment for sampling rate and interval. The DRU would be connected to each IDSP only during data retrieval. The IDSP would be able to survive environmental conditions such as: (a) heat generated by curing; (b) impact loadings due to breaking waves and collisions between moving armor units; and (c) moisture from uncured concrete and from surrounding water entering micro cracks in concrete.

A84-069 TITLE: Terrain Signature Characterization for Mine/Minefield Detection Based on Spectral and Textural Analysis

DESCRIPTION: This effort would address the feasibility of detecting surface mine within a variety of backgrounds using high-resolution digital data presently available at the Waterways Experiment Station. The data were acquired with a multi spectral scanner (MSS) system. The spectral characterizations available are: (a) 0.38 – 1.1 m (visible – near infrared) and (b) 8.5 – 12.5 m (thermal infrared). The proposed research will concentrate on investigating the ability of spectral and textural analysis based on algorithms to enhance surface mine detectability.

A84-070 TITLE: Development of Dynamic Airblast Gage for 80,000 psi Explosive Environment

DESCRIPTION: The intended use for the gage is to measure airblast and impulse (i.e., actual impulse per unit area or the time integral of the airblast) from explosive detonations. Proposed gage should have a resonant frequency of not less than 400 kHz, be less than 3 x 3 x 3 inches, be acceleration hardened and compensated greater than 150 kilo

g's, and have a full-scale output of not less than 200 mv. The physical dimensions are critical evaluation criteria. Signal conditioners not hardened for the intended explosive environment can be no closer to the transducer than 500 feet and connected to the transducer with off-the-shelf instrumentation cable.

A84-071 TITLE: Develop Biochemically Produced Cement

DESCRIPTION: The objective is to develop a biochemically produced cement that could be substituted for conventional portland cement. The production of portland cement is a high-energy-consumption industry. Biochemically produced cement will reduce this energy consumption and can make small, portable-scale cement-producing plants possible. The initial steps would be to develop an organism that can digest raw materials and produce as a part of its by product a substance that is cementitious.

A84-072 TITLE: Development of an Ultrasonic Pulse Echo System for Evaluation of Concrete

DESCRIPTION: The repair of locks and dams will be expensive. No ultrasonic pulse echo system is commercially available for evaluating concrete like other materials. Eight years of research by Ohio State University, 3 years of research by the Army Corps of Engineers, and work by others has shown that a system is feasible. A nondestructive device is urgently needed to assess the condition of concrete in various structures.

A84-073 TITLE: Software to Convert FORTRAN IV (CDC 600 Computer System) Programs to FORTRAN 77 Compatible with the Harris 500 Computer System

DESCRIPTION: A number of programs written in FORTRAN IV and operating on a CDC 6600 computer system are needed on the Harris 500 computer system. Conversion is time consuming and a conversion program to automatically convert FORTRAN IV code the FORTRAN 77 code would save considerable time and cost.

A84-074 TITLE: Software to convert FORTRAN IV (Honeywell Computer System) Programs to FORTRAN 77 compatible with the Harris 500 Computer System

DESCRIPTION: A number of programs written in FORTRAN IV and operating on a Honeywell DPS-1 computer system are needed on the Harris 500 computer system. Conversion is time consuming and a conversion program to automatically convert FORTRAN IV code the FORTRAN 77 code would save considerable time and cost.

A84-075 TITLE: Software to Convert FORTRAN IV or FORTRAN 77 to Microsoft FORTRAN 80

DESCRIPTION: A number of programs written in FORTRAN IV and operating on a CDC 6600 computer system and in FORTRAN 77 and operating on the Harris 500 computer systems in CE districts can be used on microcomputers with a CP/M operating system and Microsoft FORTRAN 80. Conversion will be time consuming and a program to automatically convert the existing programs to FORTRAN 80 would save considerable time and money.

A84-076 TITLE: Automatic Computer Picking of Seismic Events from a Digitized Seismic Record

DESCRIPTION: The proposer should develop a rationale and a computer code (FORTRAN V or equivalent) for the automatic picking of a discrete seismic event (i.e., first arrival of the P-wave or S-wave) embedded in the received seismic signal. The method developed must be capable of working in a low signal-to-noise ratio environment and must discriminate to at least 0.5 milliseconds. The algorithm must be self-verifying in that it is indeed an event as opposed to a random noise spike. The rationale for selecting event start-up times and distinguishing events from noise spikes must be well documented. The computer code must be verified by demonstrating its performance on data provided by the Earthquake Engineering and Geophysics Division of the Geotechnical Laboratory, WES.

A84-077 TITLE: Subunit Vaccines for Military-Important Diseases

DESCRIPTION: Subunit vaccines are those composed of key portions of killed microorganisms. The aim of this effort is to rid the killed microorganism of undesirable components by utilizing the techniques of microbial engineering and identifying just those parts of an organism that are able to produce immunity without side effects and to utilize genetic engineering to produce these purified antigens in large quantities.

A84-078 TITLE: Individual Blast Overpressure Dosimeter

DESCRIPTION: There is a need for an individual blast overpressure dosimeter which will measure a 10-150-psi blast wave. The size should be the same or smaller than the present-day individual radiation dosimeter and should be able to read without electronic equipment.

A84-079 TITLE: Bone Substitute

DESCRIPTION: Biocompatible synthetic materials or despeciated bone are required for repair/replacement of bone to eliminate secondary surgical procedures to obtain autogenous bone for grafting.

A84-080 TITLE: Wound Dressing

DESCRIPTION: Due to delayed evacuation for definitive treatment, a field bandage is required which can control hemorrhage, infection, and pain.

A84-081 TITLE: Field Equipment

DESCRIPTION: Surgical, medical, and dental diagnostic and treatment items and equipment system used by units deployed in forward and combat areas must meet the following requirements: small cubic size, light weight (individual items must be one/two person portable), energy and resource efficient, and resistant to moisture or chemical agent contamination. Electronics, where required, must have a multi-source capability, be electron magnetic, pulse resistant, and capable of modular replacement.

A84-082 TITLE: Cleansing

DESCRIPTION: A non-water-requiring bathing system that does not dry the skin is required for soldier's personal hygiene as well as nonirritating depilatory.

A84-083 TITLE: Drugs

DESCRIPTION: A short-acting (onset within 30 minutes and duration of 6 hours) nonsedating anxiolytic that does not interfere with mentation is needed in treatment of psychiatric battle casualties.

A84-084 TITLE: Tissue Adhesive(s)

DESCRIPTION: There is a need for an adhesive(s) for treatment of hard and/or soft tissue. The adhesive(s) should have the following characteristics: be hemostatic; can be applied to surface and/or visceral tissue; can be applied in presence of tissue fluid/blood; application system must permit delivery to a precise location; prevent seepage of fluid or cause deformation of tissue; be totally biodegradable within 90 days; its components and biodegradation products must be tissue compatible so as not to interfere with wound healing or have subsequent sequelae; can be

removed with a biocompatible solvent; be quick setting; not require special storage conditions; and have a long shelf life.

A84-085 TITLE: Dental Anesthesia

DESCRIPTION: There is a need for a rapid (approximately 5 minutes for effect) noninvasive method or agent for selective anesthesia in individual teeth. The method or agent must be able to be used by semiskilled dental auxiliary personnel in the field. An agent must be biocompatible, not require special storage conditions, and have a long shelf life.

A84-086 TITLE: Dental Restorative Material

DESCRIPTION: There is a need for a dental restorative material for rapid treatment of dental caries in a field environment. The material should be compatible with dental and oral tissues; be adhesive/adherent to require minimal or no cavity preparation; not require etching procedures; be technique insensitive in terms of application and manipulation; can be applied in the presence of moisture; maintain cavosurface margin and functional integrity for 12-18 months; not require special storage conditions; have a long shelf life; and remain stable over a wide range of temperature/humidity conditions.

A84-087 TITLE: Design and Synthesis of Novel Compounds as Pretreatment, Prophylaxis, and Antidotes for Chemical Warfare (CW) Agents

DESCRIPTION: New compounds based on rational scientific premise are required for evaluation to protect and/or treat personnel exposed to CW agents. These agents include the nerve agents, hydrogen cyanide, mustard, and lewisite. Effectiveness, toxicity, ease of synthesis, and scale-up potential are important considerations in the design of these compounds.

A84-088 TITLE: Innovative Approaches for Decontamination and Detoxification of CW Agents on Skin

DESCRIPTION: The rapid inactivation and/or removal of toxic CW agents from skin is an important consideration in the event of chemical exposure. New approaches compatible with human use and having the potential of meeting FDA guidelines are required for evaluation as potential skin decontaminants.

A84-089 TITLE: Mechanisms of Action of Mustard

DESCRIPTION: The vesicant agent, mustard, produces a high morbidity for unprotected personnel. Little is known of the mechanism of action of mustard so that effective protection and/or treatment can be developed. Studies should attempt to define the etiology of mustard poisoning to aid in the development of effective countermeasures.

A84-090 TITLE: Patient Dosimetry

DESCRIPTION: There is a critical need for innovative research and ultimate development of dosimetry methodology to: (1) determine exposure to chemical agents, including type of agent; (2) determine exposure dose; and (3) determine adequacy of decontamination. While the ultimate goal is a single device to accomplish required functions, innovative ideas addressing one or more required functions are required.

A84-091 TITLE: Design and Synthesis of Novel Compounds as Prophylactic/Treatment Drugs for Radiation Injury

DESCRIPTION: New compounds based on rational, scientific premises are required for evaluation to protect and/or treat personnel exposed to radiation from nuclear weapons and/or fallout. Protection from both gamma and neutron radiation is needed, and a potential protectant must show efficacy when administered orally. Effectiveness, toxicity, stability, ease of synthesis and scale-up potential are important considerations in the design of these compounds.

A84-092 TITLE: Miniature Performance Assessment Battery

DESCRIPTION: The human Performance Assessment Battery (PAB) currently being used by the US Army Medical Research and Development Command is a microcomputer-based testing device used to monitor changes in soldier mood and cognition. It is implemented in an Apple II Plus (6502) microcomputer with floppy disk. While suitable for laboratory use, it is not adequately militarized, miniaturized, or flexible enough to be suitable for large-scale data collection in a field setting. The requirement exists for construction 50 small, portable, microprocessor-based test devices which emulate the existing PAB device but which also are capable of being clustered about larger, data management microcomputers (Apple II Plus).

A84-093 TITLE: Multi-sensor Chemical Detector and Measurement System

DESCRIPTION: This system is to be used in profiling gases encountered in the helicopter environment. The instrument should be able to analyze the air within an aircraft with a real time readout of five component gases such as ammonia, carbon monoxide, total hydrocarbons, oxides of nitrogen, and hydrogen chloride. It must be portable, powered by battery, and capable of storing the data derived on magnetic tape for future reduction. Such an instrument would be used for the assessment of work environments that may be presented with the hazards of toxic gases from engine exhaust and/or gun gases.

A84-094 TITLE: In-Flight Blood Pressure Monitor

DESCRIPTION: A blood pressure monitor that utilizes pulse wave velocity would be an asset to the physiological assessment of personnel in flight. At the present time, most blood pressure monitors utilize a manometer and sound detector to perform the analysis; however, due to the high noise and vibratory environment in aircraft (mainly helicopters), it is almost impossible to perform a blood pressure determination. Use of the pulse wave velocity, which equates the speed of the pulse wave over a standard distance with a manometer blood pressure, would be immune to the high noise and vibrations encountered in the aircraft.

A84-095 TITLE: Miniaturized Pocket Portable Defibrillator

DESCRIPTION: Present defibrillation systems, although portable, do not interface well with medical aviation aircraft and are cumbersome when in ground ambulance and emergency rooms. This small system would be required to generate 400 watts of DC current instantaneously and possess the capacity to recycle at least three times before being recharged.

A84-096 TITLE: Wireless 12-Lead Cardiac Monitoring System for Pulmonary Stress Testing

DESCRIPTION: Because of the continuous activity during activity cardiopulmonary stress testing, electrode retention, motion noise, and AC interference can cause unacceptable lead tracing and thus difficult diagnoses. The proposed system would be required to provide the means of collecting 12-lead information through telemetry and computer sampling techniques. Computer buffered storage or lead data would be required such that it would be reproducible for 12-leads suitable for hard copy.

A84-097 TITLE: Literature Review and Critique of Methods to Assess Human Performance in Dynamic Vehicle/Operator Setting

DESCRIPTION: Human performance limitations are increasingly important to the US Army as increasing levels of technology and stress make human performance the weak link in weapon systems. Increasingly, operators of vehicles are being pressed into service as weapons technicians, with an example being the decision to arm single-pilot Scout helicopters. The tasks being given to operators are often mentally absorbing and usually secondary to safe vehicle operation. A literature review and critique of methods to assess human performance in a dynamic, multitask vehicle operation setting is required to reduce duplication of effort and facilitate development of tests suitable for military vehicles and operational settings.

A84-098 TITLE: Wind Velocity/Vector Measurement System for In-Flight Research

DESCRIPTION: The ability to measure operator (pilot) control inputs and machine (helicopter) response has progressed to the point that variations in operation (flight), due to the influence of wind force and vector, mask subtle indicators of fatigue and strain. Wind vector and force need to be determined at rates up to 20 times a second and fed to onboard computers in order that corrections for wind vector can be made and response to dynamic wind forces be documented. Such a device would be required to operate free of rotor wash artifact and operate in extremes of temperature and vibration. Ease and reliability of calibration are a must.

A84-099 TITLE: Impact Headform Development

DESCRIPTION: The existing state of the art is the Wayne State University (WSU) "humanoid" headform. The headform has a very weak neck attachment. A headform is desired to simulate the mechanical response of the human head in a similar manner to the WSU headform, but also provide a durable neck attachment at the C2-C3 level.

A84-100 TITLE: In-The-Ear Talk-Through Hearing Protection

DESCRIPTION: The objective is to develop a prototype device (concept evaluation) incorporating talk-through communication capability and noise limiting circuitry into earplug hearing protectors. High attenuation along with broadband-limiting characteristics are required. Research is anticipated to include technology assessment, design, prototype development, and appropriate testing and evaluation.

A84-101 TITLE: Miniaturized Communication Transducers

DESCRIPTION: The objective is to develop miniature speakers and microphones for use in hearing protection and communication systems, in order to reduce the overall risks of noise-induced hearing loss. The principle followed is to reduce the non information noise components. Desired products include design specifications, prototype devices, and test and evaluation data.

A84-102 TITLE: Survey of Contact Lenses

DESCRIPTION: The objective is to evaluate all available extended-wear contact lenses for potential use under combat aviation conditions. Laboratory test procedures (chemical and physical evaluation) would most likely be used to quantitatively characterize each lens. Clinical and field tests may be necessary for operational evaluation. Using criteria specified by the Army, the various lenses would be compared in terms of suitability for combat use. The lenses should correct for astigmatism, be field aseptisizable (preferably chemically), be tear resistant, have favorable high oxygen permeability, be capable of being worn in a flight environment for 24 to 48 hours without removal, have a high refraction consistency during manufacture, and will not uptake or concentrate toxic materials

or fumes. Based on the comparative evaluations, one or two lenses would be recommended for field evaluation by the Army.

A84-103 TITLE: Survey of Vision Tests

DESCRIPTION: The objective is to catalog all available and developmental tests of human visual functions. Clinical and research, psychophysical and physiological procedures are all of direct interest, with a definite emphasis on objective, quantitative techniques. Once identified and described, selected tests could be given limited evaluation. The resulting catalog with supporting database is to be used in developing new vision standards for Army aviation. The various aspects of vision to be addressed include: spatial vision, including static/dynamic visual activity and contrast sensitivity; movement perception, including moving targets; color vision; retinal sensitivity, including adaptation and incremental change; binocular vision, including ocular rivalry; peripheral vision and perimetry; depth perception; ocular pursuit; and oculo-vestibular interactions.

A84-104 TITLE: Dynamic Visual Acuity Tester for Field Use

DESCRIPTION: The objective is to develop a field-hardened prototype of a US Army Aeomedical Research Laboratory-developed system for testing dynamic visual acuity. The basic system provides an image on a rear-projected screen, derived from a high-resolution target projected by a two-axis scanning system controlled by integrated circuits to accomplish rotary and linear motion in four axes. The system should include a fixed viewing distance, an operator viewing port, monocular and binocular test modes, a second stationary projection system to vary the background, and be easily transportable by two persons. Developmental efforts will focus on ruggedness, portability, and reliability. Desired projects include design specification, a prototype device, and test and evaluation data.

A84-105 TITLE: Computer Graphics Control System

DESCRIPTION: The objective is to develop software programs for controlling computer graphics displays which will be used for research in visual psychophysics and visual physiology. General and special-purpose programs are required for an existing in-house system which consist of a color tachistoscope in which color, form, and movement can be controlled independently. The major component of the system is a Genisco-3000 graphics display system (color) which can be controlled by either a PDP 1134 or LSI 11/23 control system. Desired products include computer-ready programs which are user compatible, programs documentation (including flow diagrams and operating manuals), and installation and debugging.

A84-106 TITLE: Research in Leadership Development

DESCRIPTION: Research support is required for a comprehensive progressive sequential leader development program from the perspective of the total Army system. Of particular interest are: decision making and decision support systems; cognitive skills assessment and development; the relations between leadership, unit/organizational effectiveness, and productivity; and senior leadership requirements.

A84-107 TITLE: Research in Developing Optimum Methods for Measuring Job Performance

DESCRIPTION: The Army is designing a total selection and classification system that involves predictor measures (to help select the right people and place them in appropriate jobs) and performance measures (to tell us how well the soldiers perform after joining the Army). Four types of performance measures are of great importance to the Army: (1) training measures, i.e., measures of progress in the training situation; (2) MOS-specific measures, i.e. measures of actual performance on the job; (3) Army-wide measures, i.e., measures of "good soldiering" or soldier effectiveness that cut across all jobs; and (4) measures of unit effectiveness. The primary research need is for new approaches to performance assessment in each of these categories.

A84-108 TITLE: Research in Projecting Manpower and Skill Level Requirements Early in Weapon System Development

DESCRIPTION: Historically, the system acquisition process has been driven by cost, adherence to schedule, and hardware/software performance. Recently, increased emphasis has been given to early identification of the human resources needed to operate and maintain the new systems. Accurate estimates of the number of individuals and the skills they must possess provide a basis for: (a) comparisons with estimated future supply; (b) identification of system changes to reduce operator and maintainer requirements; and (c) selection among competing systems. Innovative techniques which can be used to generate quantitative and qualitative estimates of operator and maintainer requirement on the basis of information available during concept development are needed. Procedures for estimating ability requirements are especially desired.

A84-109 TITLE: Research in the Application of Artificial Intelligence Techniques to the Generation of Options in Planning

DESCRIPTION: It is anticipated that in tactical situation a decade or more in the future, decision makers and those planning large actions will be flooded with data which will have to be compiled, evaluated, and analyzed for use. Efforts are needed to determine optimal use of the computer to assist in such operations. Current planning algorithms implemented on computers today do not provide options for the planner or decision maker and are not sensitive to changing constraints or environmental conditions, nor do they provide anticipated outcomes with associated probability values. Research towards the development of such systems is urgently needed.

A84-110 TITLE: Research on Cognitive Processes in Decision making Under Uncertainty and Time Stress

DESCRIPTION: Commanders, intelligence analysts, and others are often required to make decisions under conditions of uncertainty and severe time stress. Uncertainties may be associated with missing, incomplete, or ambiguous information, or with future outcomes that are unknown. Research is needed to: (1) better understand the cognitive processes (e.g., memory, judgment, or problem solving) if the decision maker under such conditions, and (2) suggest approaches for supporting the cognitive processes so that the overall quality and timeliness of decisions made under uncertainty and time stress are enhanced.

A84-111 TITLE: Algorithm Analysis and Test

DESCRIPTION: Using ballistic missile defense (BMD) effectiveness methodology, evaluate selected candidate software algorithms to establish sensitivities and performance bounds of software requirements. Algorithms to be evaluated are portions of those being developed by prime contractor for Sentry BMD system. This evaluation shall include the assessment of the generic nature of candidate algorithms to verify their adaptability to various threats, missions, and basing modes.